

[Document Name] Scope of Claims

[Claim 1]

A method for manufacturing a semiconductor device, including a heat treatment step of pulsed light irradiation, comprising the steps of:

forming separately island-like light-absorbing layers that are capable of absorbing the pulsed light over a glass substrate;

forming a semiconductor layer and an insulating layer overlapping with the semiconductor layer between the glass substrate and the light-absorbing layers; and

performing the heat treatment for the semiconductor layer and the insulating layer by selectively heating the light-absorbing layers through the pulsed light irradiation.

[Claim 2]

A method for manufacturing a semiconductor device, including a heat treatment step of pulsed light irradiation, comprising the steps of:

forming separately island-like light-absorbing layers whose transmission factor of the pulsed light is 70 percent or less over a glass substrate whose transmission factor of the pulsed light is 70 percent or more;

forming a semiconductor layer and an insulating layer overlapping with the semiconductor layer between the glass substrate and the light-absorbing layers; and

performing the heat treatment for the semiconductor layer and the insulating layer by selectively heating the light-absorbing layers through the pulsed light irradiation.

[Claim 3]

A method for manufacturing a semiconductor device comprising the steps of:

- forming island-like light-absorbing layers formed over a glass substrate having an insulating surface such that a length of one side of the light-absorbing layer is equal to or less than a thickness of the glass substrate;
- forming a semiconductor layer and an insulating layer overlapping with the semiconductor layer between the glass substrate and the light-absorbing layers; and
- performing a heat treatment for the semiconductor layer and the insulating layer by selectively heating the light-absorbing layers through the pulsed light irradiation.

[Claim 4]

A method for manufacturing a semiconductor device comprising the steps of:

- forming and patterning island-like light-absorbing layers whose transmission factor of pulsed light is 70 percent or less such that a length of one side of the light-absorbing layer is equal to or less than a thickness of a glass substrate, over the glass substrate whose transmission factor of the pulsed light that is emitted from a pulsed light source is 70 percent or more;
- forming a semiconductor layer and an insulating layer overlapping with the semiconductor layer between the glass substrate and the light-absorbing layers; and
- performing a heat treatment for the semiconductor layer and the insulating layer by selectively heating the light-absorbing layers through the pulsed light irradiation.

[Claim 5]

A method for manufacturing a semiconductor device comprising the steps of:

- forming island-like divided semiconductor layers over a glass substrate having an insulating surface;

forming a light-absorbing layer that overlaps with a whole surface of each of the semiconductor layers through an insulating layer and whose end portions are arranged outside of each of the semiconductor layers; and

performing a heat treatment for each of the semiconductor layers and the insulating layer by selectively heating the light-absorbing layer through pulsed light irradiation.

[Claim 6]

A method for manufacturing a semiconductor device comprising the steps of:

forming a first insulating layer over a glass substrate having an insulating surface;

forming island-like divided semiconductor layers over the first insulating layer;

forming a second insulating layer covering a top face and a side face of each of the semiconductor layers;

forming a light-absorbing layer over the second insulating layer, the light-absorbing layer that covers the top face and the side face of each of the semiconductor layers and whose end portions are arranged outside of each of the semiconductor layers;

performing a heat treatment for each of the semiconductor layers and the insulating layer by selectively heating the light-absorbing layer through pulsed light irradiation; and

forming a gate electrode overlapping with each of the semiconductor layers by forming a metal layer over the light-absorbing layer and then performing an etching step.

[Claim 7]

A method for manufacturing a semiconductor device comprising the steps of:

forming island-like divided semiconductor layers over a glass substrate;
forming a light-absorbing layer that overlaps with a whole surface of each of the semiconductor layers through an insulating layer and whose end portions are arranged outside of each of the semiconductor layers; and

performing a heat treatment for each of the semiconductor layers and the insulating layer by selectively heating the light-absorbing layer through a plurality of times of pulsed light irradiation.

[Claim 8]

A method for manufacturing a semiconductor device comprising the steps of:
forming island-like divided semiconductor layers over a glass substrate whose transmission factor of pulsed light that is emitted from a pulsed light source is 70 percent or more;

forming a light-absorbing layer that overlaps with a whole surface of each of the semiconductor layers through an insulating layer, whose end portions are arranged outside of each of the semiconductor layers, and whose transmission factor of the pulsed light is 70 percent or less; and

performing a heat treatment for each of the semiconductor layers and the insulating layer by selectively heating the light-absorbing layer through a plurality of times of the pulsed light irradiation.

[Claim 9]

A method for manufacturing a semiconductor device according to any one of Claims 1 to 8, wherein the light-absorbing layer is formed from a metal nitride.

[Claim 10]

A method for manufacturing a semiconductor device according to any one of Claims 1 to 8, wherein the pulsed light is coherent light.

[Claim 11]

A method for manufacturing a semiconductor device according to any one of Claims 1 to 8, wherein the pulsed light is coherent light that has a pulse width of from 10 to 100 nanoseconds.

[Claim 12]

A method for manufacturing a semiconductor device according to any one of Claims 1 to 8, wherein the pulsed light is non-coherent light with from 1 to 100 microseconds.

[Claim 13]

A method for manufacturing a semiconductor device according to any one of Claims 1 to 8, wherein a light source of the pulsed light is a pulsed laser oscillator.

[Claim 14]

A method for manufacturing a semiconductor device according to any one of Claims 1 to 8, wherein a light source of the pulsed light is a xenon flash lamp.

[Claim 15]

A heat treatment method comprising the steps of:

forming and patterning a light-absorbing layer over a glass substrate having an insulating surface such that a length of one side of the light-absorbing layer is equal to or less than a thickness of the glass substrate;

providing an object to be heated that is arranged inside of the light-absorbing layer, between the glass substrate and the light-absorbing layer; and

performing a heat treatment for the object to be heated by selectively heating the light-absorbing layer through pulsed light irradiation.

[Claim 16]

A heat treatment method comprising the steps of:

forming and patterning a light-absorbing layer whose transmission factor of pulsed light is 70 percent or less such that a length of one side of the light-absorbing layer is equal to or less than a thickness of a glass substrate over the glass substrate whose transmission factor of the pulsed light that is emitted from a pulsed light source is 70 percent or more;

providing an object to be heated that is arranged inside of the light-absorbing layer between the glass substrate and the light-absorbing layer; and

performing a heat treatment for the object to be heated by selectively heating a region where the light-absorbing layer is formed, through the pulsed light irradiation.

[Claim 17]

A heat treatment method according to Claim 15 or 16, wherein the light-absorbing layer is formed from a metal nitride.

[Claim 18]

A heat treatment method according to Claim 15 or 16, wherein the pulsed light is coherent light.

[Claim 19]

A heat treatment method according to Claim 15 or 16, wherein the pulsed light is coherent light that has a pulse width of from 10 to 100 nanoseconds.

[Claim 20]

A heat treatment method according to Claims 15 or 16, wherein the pulsed light is non-coherent light with from 1 to 100 microseconds.

[Claim 21]

A heat treatment method according to Claim 15 or 16, wherein a light source of the pulsed light is a pulsed laser oscillator.

[Claim 22]

A heat treatment method according to Claim 15 or 16, wherein a light source of the pulsed light is a xenon flash lamp.